

Application No. 10/675,569
Reply to Office action

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JUL 05 2006

Amendments to the claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A system to measure a gas flow rate of a gas supplied from a mass flow controller to a process chamber via a process line, the system comprising:

a. ~~[[said]]~~a mass flow controller;

b. a process chamber;

c. a process line providing a direct passage for said gas between said mass flow controller and said process chamber through a process line control valve;

d[[b]]. a vent line fluidly connecting to said process line at a junction between said mass flow controller and said process line control valve, and having a main vent line shut-off valve~~process chamber, said vent line comprising;~~

e[[i]]. a bypass loop ~~having~~extending between an inlet junction and a return junction that fluidly connect the bypass loop to the vent line, wherein the main vent line shut-off valve is disposed between the inlet junction and the return junction ~~fluidly connecting said bypass loop to said vent line, [[and]] said bypass loop comprising~~

a. a flow detector adapted to provide a measurement of said gas flow rate as said gas, supplied from the mass flow controller, flows through both said flow detector and said bypass loop;

b. a first bypass control valve between said inlet junction and said flow detector;

~~ii. a main vent line shut-off valve between said inlet junction and said return junction; and~~

f[[c]]. a computational control device that receives data signals from said flow detector;

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whereby said gas while flowing through said bypass loop provides for said measurement of said mass flow controller's gas flow rate which provides information for quantitation or for calibration of said mass flow controller.

2. (previously presented) The system of claim 1, wherein said flow detector is a bypass mass flow controller.

3. (original) The system of claim 1, wherein said bypass loop additionally comprises a second bypass control valve between said flow detector and said return junction.

4. (canceled)

5. (original) The system of claim 1, additionally comprising a manifold fluidly connecting two or more mass flow controllers to said vent line, whereby valving control of the manifold provides gas from any one of said two or more mass flow controllers to said vent line for said measurement.

6. (canceled)

7. (original) The system of claim 1, additionally comprising a back pressure or a back vacuum compensating system to provide a back pressure or a back vacuum to the flow detector in the bypass loop that is representative of the back pressure or back vacuum existing the said process chamber during use of said gas.

8. (canceled)

9. (currently amended) The system of claim ~~[[8]]~~20, wherein said flow detector is a bypass mass flow controller.

10. (canceled)

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11. (currently amended) The system of claim ~~[[8]]~~1, wherein said bypass loop additionally comprises a pressure release valve between said flow detector and said return junction.

12. (canceled)

13. (canceled)

14. (currently amended) A system to measure a gas flow rate for a gas provided from a dedicated means for metering ~~a gas to a process chamber via a process line~~, the system comprising:

~~[[said]]~~a dedicated means for metering;

a process chamber;

a process line providing a direct passage for said gas between said mass flow controller and said process chamber through a process line valve;

a vent line fluidly connecting to said process line at a junction between said dedicated means for metering and said process line valve~~process chamber, said line beginning at an inlet junction and comprising;~~

a bypass loop formed and extending between an inlet junction and a return junction fluidly connected to the vent line, said bypass loop comprising

a first means to control a gas flow flowing through said line, located between said inlet junction and a means for measuring; and

said means for measuring the gas flow flowing through said line, wherein said means for measuring is adapted to provide a measurement of said gas flow rate as said gas flows through both the means for measuring and the line;

~~a means to direct gas through either the process line or the vent line fluidly connecting to said process line; and~~

a computational control device that receives data signals from said means for measuring a gas flow; whereby said gas while flowing through said line fluidly

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connecting to said process line provides for said measurement of said flow rate of said gas through said dedicated means for metering which provides information for quantitation or for calibration of said dedicated means for metering.

15. (previously presented) The system of claim 14, wherein said measurement is repeated over time and is used to quantify the gas flow rate passing through said dedicated means for metering.

16. (original) The system of claim 14, additionally comprising at least one additional dedicated means for metering at least one additional gas.

17. (original) The system of claim 16, wherein a comparison between set and measured flow rates of two or more of said dedicated means for metering, by said means for measuring a gas flow flowing through said line, provides a correction factor for said means for measuring a gas flow flowing through said line.

18. (currently amended) A method to calibrate a flow of gas to a process chamber that is set by a mass flow controller, comprising the steps of: providing a vent line, terminating in an exhaust and/or abatement system, that joins a process line between a mass flow controller and a process line control valve upstream of a process chamber, providing a bypass loop intersecting the vent line at an inlet junction and a return junction and comprising a flow detector adapted to provide a measurement of a calibrating gas flow as said calibrating gas flow flows through both said flow detector and said bypass loop, a main vent line shut-off valve positioned between the inlet junction and the return junction; setting the mass flow controller to a specific gas flow rate; adjusting the process line control and main vent line shut-off valves to direct a calibrating gas flow from said mass flow controller through the vent line and into [a]the bypass loop in fluid communication with a process line by means of through [an]the inlet junction and a return junction, said bypass loop also comprising a flow detector adapted to provide a measurement of said calibrating gas flow as said calibrating gas

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~~flow flows through both said flow detector and said bypass loop; measuring a bypass loop gas flow rate of said calibrating gas flow with said flow detector; comparing said bypass loop gas flow rate to said desired gas flow rate; and calculating a relationship between said bypass loop gas flow rate and said desired gas flow rate whereby said relationship provides information to quantitate or to calibrate said mass flow controller, or to replace or to repair said mass flow controller.~~

19. (canceled)

20. (new) A system to measure a gas flow rate from a plurality of mass flow controllers, the system comprising:

a process chamber;

a plurality of mass flow controllers each supplying a gas to the process chamber through a respective process line providing a direct passage for said gas between the respective mass flow controller and said process chamber through a respective process line valve;

a bypass loop comprising a fluid detector and fluidly connected to a vent line through a bypass to vent line having a bypass to vent valve;

a plurality of first bypass control valves, each provided between a junction in one of the plurality of process lines, the junction between a respective mass flow controller and a respective process line valve, and the bypass loop;

a plurality of second bypass control valves, each provided between a junction in one of the plurality of process lines, the junction between a respective process line valve and the process chamber, and the bypass loop; and

a computational control device that receives data signals from the flow detector;

wherein the bypass loop is adapted to receive a selected gas from one of the plurality of mass flow controllers through a respective first bypass control valve, the flow detector adapted to provide a measurement of said gas flow rate as said gas flows through the flow detector, and wherein said selected gas while flowing through said bypass loop provides for said measurement of said mass flow controller's gas flow rate which

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provides information for quantitation or for calibration of said mass flow controller, wherein sequential comparison of gas flow rates by the bypass loop flow detector and each of two or more of the mass flow controllers provides for a determination of possible error or defect in one of the mass flow controllers, and wherein the selected gas flow leaving the bypass loop may be directed to the process chamber through the respective second bypass control valve, or, as an alternative option, may be directed through the valved bypass to the vent line for exhaust and/or abatement.